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March 16, 1995

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BY HAND DELIVERY

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

DOCKET FILE COPY ORIGINAL

Re: ET Docket No. 94-124, RM-8308
Ex Parte Presentation

Dear Mr. Caton:

On March 16, 1995, representatives of Hughes Communications Galaxy, Inc. ("Hughes") and Teledesic Corporation ("Teledesic") met with Federal Communications Commission ("Commission") representatives to discuss matters related to the Commission's pending proceeding in ET-Docket No. 94-124. The Hughes representatives included Dr. Louis Ippolito, Edward E. Reinhart and John Janka. Teledesic was represented by Farzad Ghazvinian and the undersigned. In addition, the Hughes and Teledesic representatives were accompanied by Dr. Teddy O'Connell of Scientific Generics.

The Commission's representatives included Thomas S. Tycz, Michael J. Marcus, Robert James, Fern J. Jarmulnek, Donna Bethea, Jennifer M. Gilsenan, Donald Cipps and Gregory Rosston.

Enclosed is a proposed meeting agenda that was circulated at the meeting. We discussed only the items under headings I, II, III and V. The enclosed materials entitled "40 GHz Microwave Equipment status and Availability in Europe" formed the basis for most of the discussions at the meeting. In addition, we discussed the equipment described in the enclosed drawings. The discussions also included some of the information with respect to 40 GHz equipment contained at pages 16-24 of Exhibit A to the Reply Comments of Hughes filed in this proceeding on March 1, 1995. In addition, we had a brief discussion about the frequency bands available under the international table of frequency allocations for satellite uplinks and the effect of rain losses on satellite uplinks.

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List A B C D E

An original and two copies of this letter are enclosed (complete with enclosures). Copies of this letter and the enclosed materials are being provided simultaneously to the Commission representatives identified above.

Very truly yours,

Tom W. Davidson, P.C.

Enclosures

cc: Thomas S. Tycz
Michael J. Marcus
Robert James
Fern J. Jarmulnek
Donna Bethea
Jennifer M. Gilsenan
Donald Gipps
Gregory Rosston

LMDS In 41 GHz Band Is Technically and Economically Feasible and 41 GHz Equipment is Available

I. Introduction & Overview

II. MVDS in the United Kingdom

1. Brief history
2. Current status of Eurobell
3. Future plans (More franchises and digital spec)
4. Availability of 41 GHz equipment

III. Availability and Cost of 41 GHz equipment in United States

IV. Technical Feasibility of LMDS at 41 GHz

1. Effect on cell size and availability

2. Attenuation due to rain

3. LMDS spectrum requirements at 41 GHz

V. Satellites at 41 GHz

40 GHz Microwave Equipment, Status and Availability in Europe

Scientific Generics

Dr. Teddy O'Connell

Ref

MVDS - History

- Aug 1989, the UK RA selected 40.5 GHz to 42.5 GHz band for MVDS
- In 1990, CEPT recommended that the band 40.5 - 42.5 GHz be adopted into domestic allocation for MVDS
- MVDS working group established to create necessary technical, planning and licensing rules for analog MVDS
- MPT 1550 specification created in Sept 1993. This has been drafted to provide the maximum commonality between MVDS and ASTRA satellite DTH receivers.
- In Europe 11 countries have designated the 40 GHz band for MVDS and 9 plan to do so
- In 1994 working group re-convened to develop specification for digital compressed TV with voice and data return links

UK MVDS - Current Status

- EUROBELL - local delivery franchise awarded for 100K homes in West Kent, UK
  - approx 35 cells, average 1500 homes per cell
  - Local Delivery - full interactive service to 16,200 homes
  - Regional Delivery - Microwave relay of standard satellite channels
  - Service roll-out 1996-1998, initially using Philips equipment
- At present there are also a number of other MVDS bids in preparation. These will be submitted before end of March
- MVDS radio equipment available in production from Philips Microwave and GEC Marconi by August 1995

UK MVDS - Current Status

- Currently looking towards Digital MVDS
  - Greater spectral utilisation
  - better/more stable picture quality
  - greater interactive capability e.g. Video on Demand
  - possibility of more efficient cell re-use

- RA Digital MVDS working group established in 1994

UK MVDS - Current Status

- PROPOSED DIGITAL MVDS DESIGN

- To achieve compatability with DTH systems
  - MPEG-2 compression techniques
  - QPSK modulation employed
  - 29.5 MHz channel spacing

- Back-channel method: i.e. provide return channel at approx 64 - 640 KB/s

UK MVDS - Current Status

- **PROPOSED DIGITAL MVDS DESIGN**
  - **MPEG-2 compression techniques => 2MB/s - 6MB/s per programming channel**

    Thus can contain approx 24MB/s in 1 channel

    => 4 to 12 programming channels in 29.5 MHz

    Total no. of channels is: 128 (4x32) to 384 (12x32)

    in 1 GHz

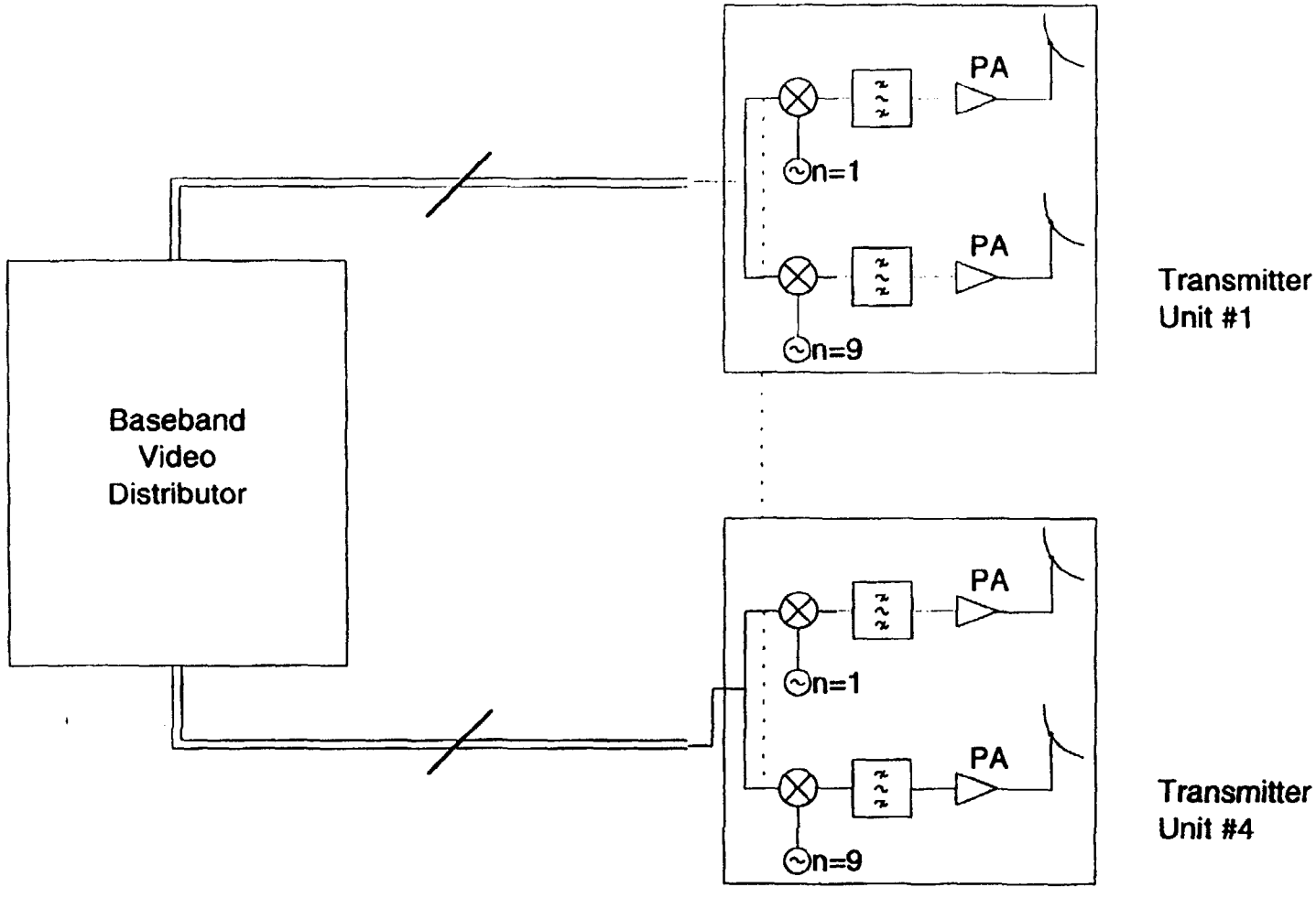
Current MVDS Equipment

- Philips Microwave - significant investment in 40 GHz radio equipment
  - approx 10 man years in developing complete system
- Demo equipment available now
- Production quantities by August 1995
- Equipment is based on achieving as much commonality as possible with existing DTH front end receivers and indoor IF demodulator units

Current MVDS Equipment

- PHILIPS Transmitter Unit specification
  - 4 transmitter units, each with 8+1 (redundant) transceiver
  - Redundant transmitter on Hot Standby (200 MHz bandwidth)
  - Seperate transmitter for each channel
  - PA technology MMIC GaAs pHEMT - Power is 23 dBm per channel
    - cost approx £800 each in volume
  - By 1996 transmitter powers of 1 Watt per channel could be available
  - Horn Antenna for each channel => 15 dB gain
  - Cost estimate: £33,000-£57,000 for transmitter station

Philips Transmitter Unit

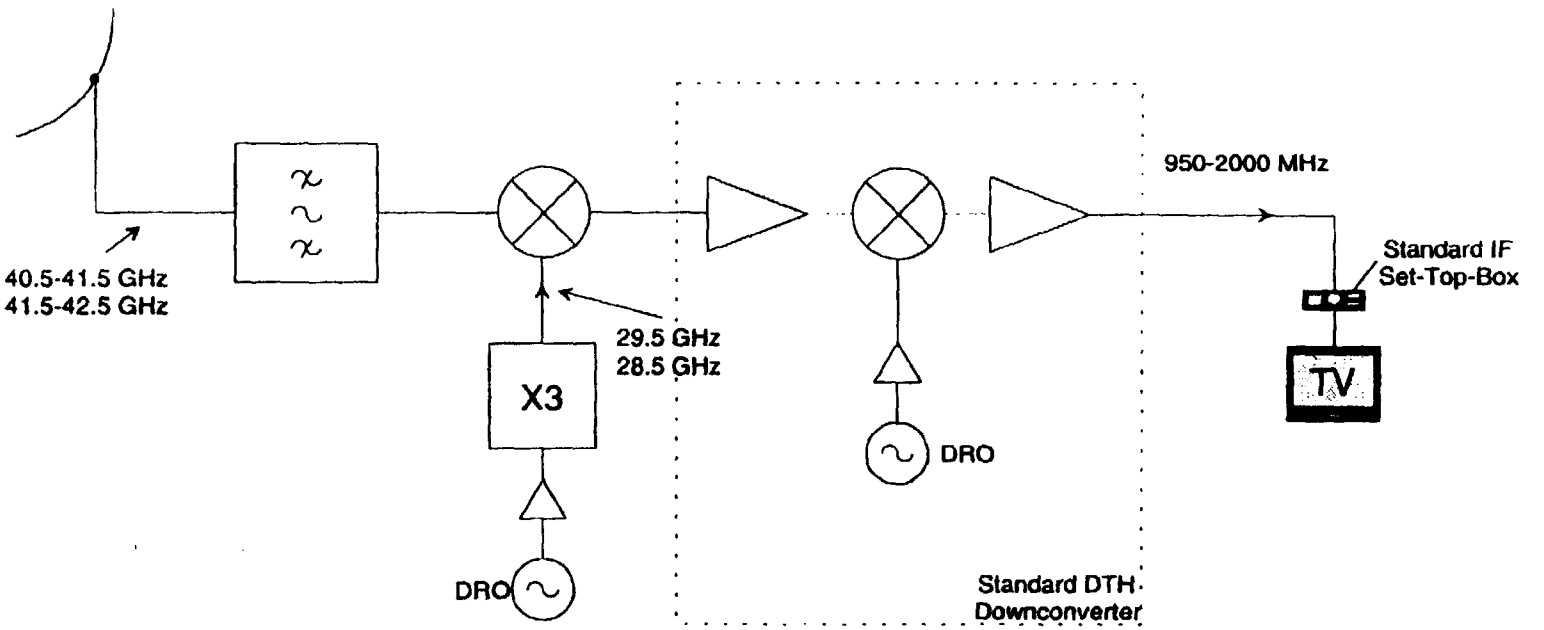


GENERICS

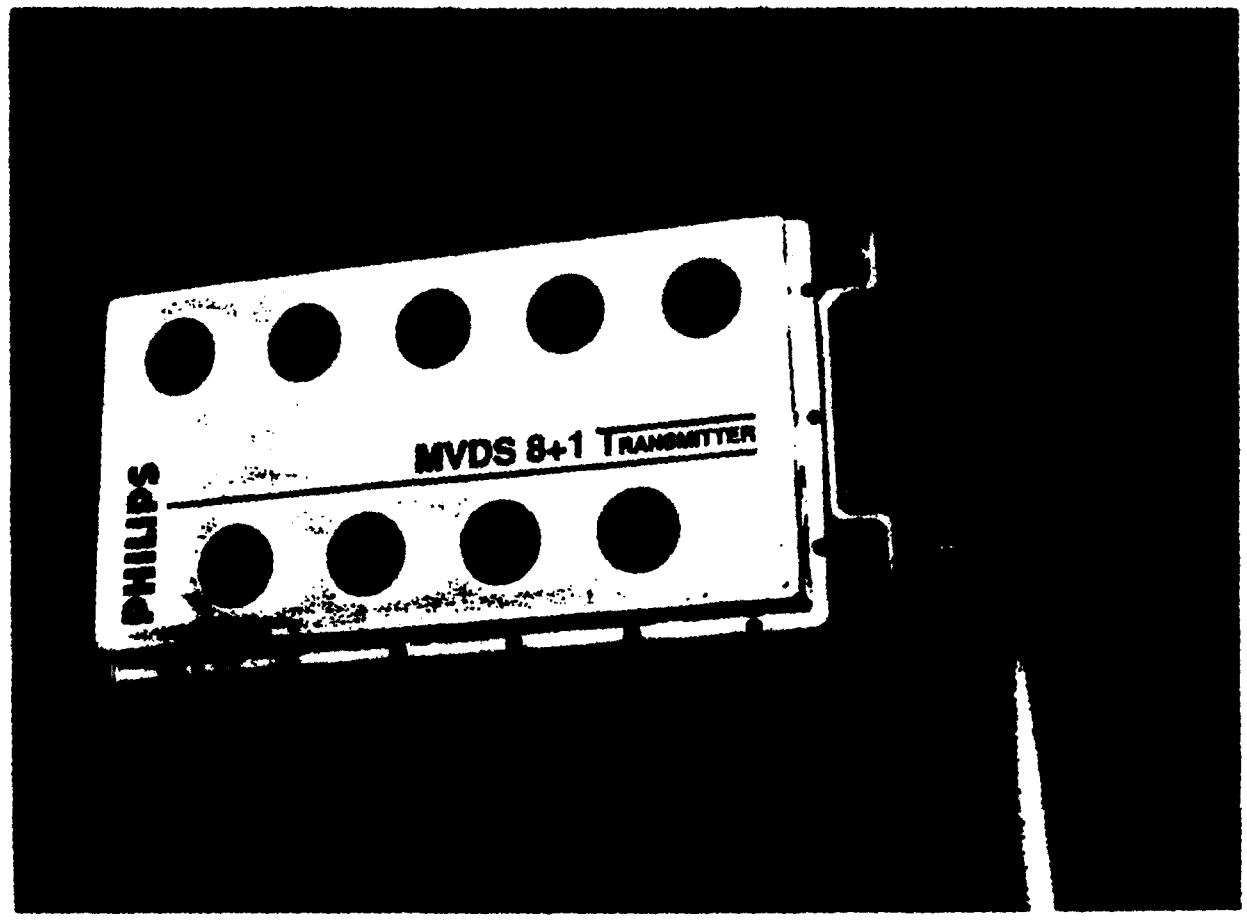
Current MVDS Equipment

- Receiver Unit
  - Based on commercially available satellite DTH Downconverter
  - Extra downconversion stage from 40 GHz to 12 GHz (1st IF)
  - 2nd IF: 950 - 2000 MHz
  - 2nd IF fed into standard satellite DTH receiver set-top box
  - Rx Antenna
    - Horn Antenna
    - Small size - low cost
    - High Gain (32 dBi) so eliminates need for LNA in Receiver
  - estimated cost for 40 GHz MVDS receiver (excluding indoor set-top box) is £65 - £130

Philips Receiver Unit



GENERICS


PHILIPS
MVDS 8+1 TRANSMITTER

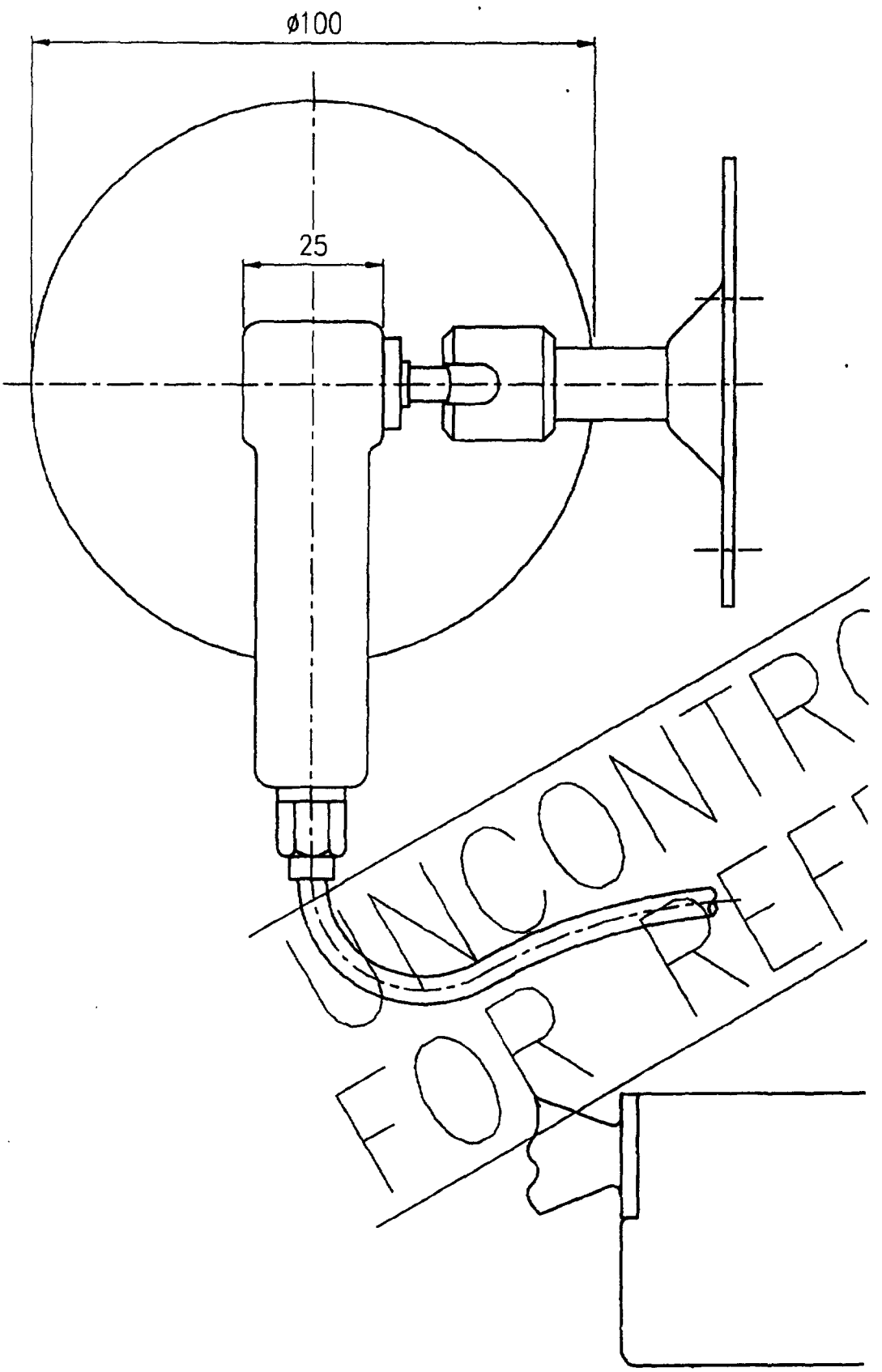
Current MVDS Equipment

- Other Hardware Providers
  - GEC Marconi, UK
    - Working on 40 GHz MVDS demo, available June 1995
    - On target for production late 1995
  - 40 GHz components available from a number of suppliers:
    - Farran Technology, Ireland
    - Thompson CSF
    - RACAL

SUMMARY

- Philips are developing 40 GHz equipment which will be available in production by August 1995
- Eurobell intend to use Philips equipment in their local delivery franchise which will begin in 1996
- Digital MVDS is currently being devloped which can provide approx 300 channels in 1 GHz
  - Philips plan to have this 40 GHz digital equipment in production by end of 1996

PHILIPS



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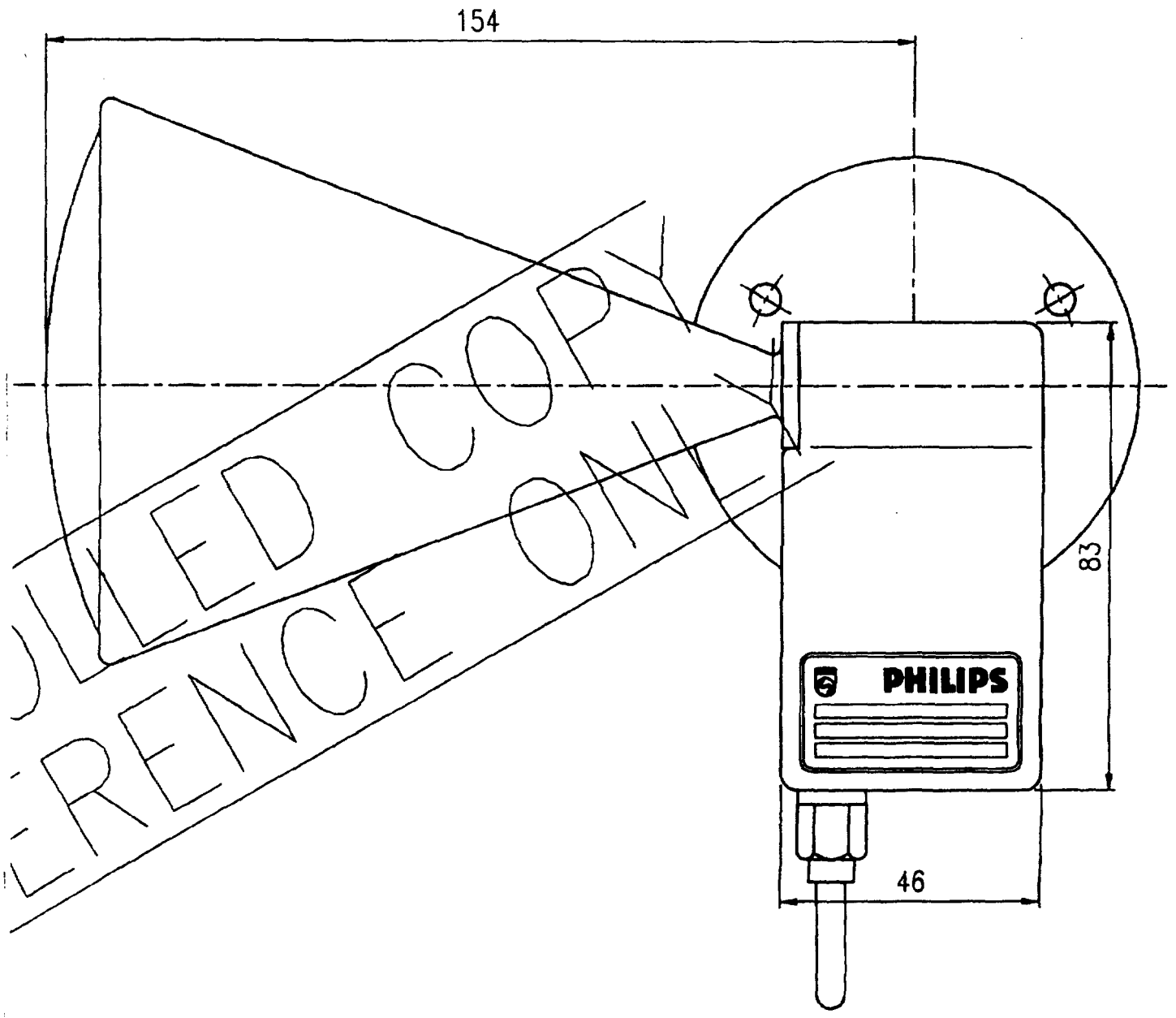

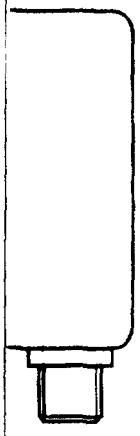

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March 10, 1995

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, DC 20554

Re: Ex Parte Presentation
ET Docket No. 94-124

Dear Mr. Caton:

On behalf of Teledesic Corporation ("Teledesic"), we are enclosing herewith for filing MPT 1550, Issue 1, "Performance Specification for Analogue Multipoint Video Distribution Systems (MVDS) Transmitters and Transmit Antennas Operating in the Frequency Band 40.5 - 42.5" (Sept. 1993), and Phillips Microwave, "Microwave Video Distribution Systems - The 1994 Position," (Dec. 1994), as an ex parte presentation in the above-captioned proceeding. These documents were cited to as references in Teledesic's engineering analysis, "Apples-to-Apples Comparison Demonstrates the Feasibility of LMDS Above 40 GHz", attached as Appendix A to its Reply Comments in the above-captioned proceeding. The materials are being filed in order to provide additional engineering support to Teledesic's showing that LMDS in the 41 GHz band is technically and economically comparable to LMDS in the 28 GHz band.

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter and its associated attachments are being filed with the FCC's Office of the Secretary.

Correspondence or inquiries concerning this matter should be directed to the undersigned.

Sincerely,

Tom W. Davidson
Jennifer A. Manner

Enclosures

Ian Clarke

Business Development Manager

Phillips Microwave

Conference: CCA Development Series - New Technology - 16 November 1994
Generously supported by Nokia Telecommunications

Microwave Video Distribution Systems - The 1994 Position

Microwave Video Distribution Systems (MVDS) have been proposed at a number of frequencies: 2,5 GHz, 12 GHz, 29 GHz and 42 GHz. Whilst there remains a place for systems at the lower frequencies, the demand in the developed world for interactive broadband multimedia delivery implies the use of the higher frequencies.

Millimetric MVDS was first proposed in Europe by BT, who envisaged a one-way broadcast system filling a niche between satellite and cable distribution. Radio enabled local tailoring of services, but avoided the high initial cost of cable. Three scenarios were foreseen: cable substitution, cable supplement and cable pullthrough. BT were able to demonstrate at their Saxmundham technical trial, and in the joint commercial demonstration with Granada T.V., the viability of the approach.

The UK Radiocommunications Agency (RA) selected the 40,5 to 42,5 GHz ITU broadcasting band for MVDS in August 1989. A working group was established to create the necessary technical, planning and licensing rules. The technical output of the group was embodied in transmitter and antenna specifications (MPT 1550, September 1993) and a report, taking the form of an Applications note. Since then, CEPT have also adopted this band for use across Europe.

The UK Broadcasting Act (1990) included provision for MVDS services, with franchises to be awarded competitively by the Independent Television Commission, (ITC). New, 'technology neutral' licences would be awarded in future, and existing cable franchises could opt to have their licences converted to the new 'Local Delivery Service', (LDS). Franchises also require licences under the Wireless Telegraphy Act for radio transmission.

The concept of MVDS is essentially cellular, and MPT 1550 provides for a four frequency set: two true frequency blocks together with the use of both vertical and horizontal polarisation. However, the ITC and RA have decided that it is not necessary to formulate a national cellular plan. New bids for LDS licences are made under the same rules, whether it is intended to use cable or MVDS. First, a potential franchisee identifies an area or community of interest, and lodges an application with the ITC. The ITC may then modify the boundary of the area if this is in the interests of increased competition, and formally advertises the area. The franchise is awarded to the highest bidder, taking into account the number of households within the area boundary to be offered the services.

Bids must include a technical plan, showing the areas to be reached by radio, the frequency plan and the interference protection ratios provided between the franchise cells, and more importantly, to future possible adjoining franchises. The onus is therefore entirely on the applicant to arrive at a suitable technical scheme.

MPT 1550 has been drafted to provide the maximum commonality between MVDS and satellite DTH receivers. Channel separations and bandwidths are therefore 29,5 MHz (copolar) and 26 MHz respectively. The four frequency set, therefore, comprises 32 channels per household. The frequency stability of the transmitter is specified as $\pm$ 0,5 MHz, and MPT 1550 also provides a spectrum and spurious transmission mask. Two antenna specifications are given: one for 64 degree sector coverage (i.e. radiation from the cell perimeter) and one for an azimuth omnidirectional antenna. The specification states that the former will normally be required, on frequency re-use grounds.

All the other system parameters, including transmit power, receiver noise figure, picture quality and service availability are unspecified, although typical values are given for planning guidance.

The transmitter power guideline of 200mW per channel is based on a review of solid state and travelling wave tube state of the art in 1991. This still represents a realistic affordable value, although by 1996 powers of up to 1W per channel could be available using pseudo-morphic HEMT devices. Similarly, the 9 dB receiver noise figure could become 5 dB with the use of p-HEMT low noise preamplifiers.

By analogy with DBS, the RA discussion documents suggests a quality criterion of C/N = 12 dB for 1% of worst month, or 0,3% of time, giving a received picture quality of CCIR impairment grade 4.

The 'first cut' LDS technical plan is prepared by reviewing the available hardware specifications, adopting a quality criterion, establishing the rainfade, rain depolarisation, and troposcatter effects for the geographical area, and using these data to establish cell sizes, transmitter sites and a frequency plan. Digital map data bases may then be used to add detail to the plan. The overheads presented below illustrate a typical process.

However, this all presupposes that the service to be provided is based on analogue F.M. unidirectional transmission. It is now expected that at least some channels of DTH satellite and cable will adopt the MPEG-2 digital format during 1995. The former will use QPSK and the latter 64 QAM. An MVDS digital service would naturally employ DTH receiver equipment with a 42 GHz downconverter; what is required is a low cost QPSK transmitter.

Service ranges and frequency plans for the QPSK option are now in active discussion. The RA and ITC have indicated that the 40 GHz Working Group will be reconvened this Autumn, to establish a digital MPT specification.

One possible route is to treat each analogue FM transmitter as a broadband composite datastream transponder. Typical MPEG-2 compression results in data rates of between 2MBit/s and 6MBit/s for typical entertainment channels. To achieve the necessary bit error rates (typically better than 10 EXP-11) at a C/N ratio of typically 8 or 9 dB, requires sophisticated forward error correction. However, at least 24 MBit/s of useful data could be carried at a 29,5 MHz channel spacing. The number of programmes per household will thus increase from 32 to at least 128.

To provide a service fully equivalent to broadband cable, it is also necessary to provide a return path, with a sufficient datarate to allow for interactivity and telephony. Values of between 6,4 kBit/s and 128 kBit/s have been suggested. The return path technology chosen will depend on the type of service and whether any infrastructure is already in place. For example, in parts of Europe, a PTT might choose to install MVDS with a copperwire return; or the similarity in cell size between GSM, DECT and MVDS could be exploited; finally, a 'greenfield' franchisee could require a millimetrewave return path, perhaps sharing the 42 GHz band. All of these scenarios would require changes to UK and/or EC regulations.